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CARRILLO STREET-PROJECT DRIVEWAY LEFT-TURN QUEUING ANALYSIS FOR RADIO SQUARE MIXED-USE PROJECT - CITY OF SANTA BARBARA

Associated Transportation Engineers (ATE) has prepared the following queuing analysis for the left-turn movement from Carrillo Street to the Radio Square Project driveway, as requested by City staff.

Left-Turn Storage

The project proposes to provide a left-turn lane on Carrillo Street at the project driveway. The project site plan shows that the left turn lane would provide 110 feet of storage, which would accommodate a queue of five vehicles. A figure showing the design of the left-turn pocket is attached.

Forecast Traffic Volumes

Traffic volumes were estimated for the project driveway on Carrillo Street based on the trip generation and trip distribution estimates developed for the project and the traffic counts collected at the adjacent intersection of Carrillo Street and De La Vina Street. The trip generation/distribution data show that the inbound left-turn movement from Carrillo Street to the project driveway is 78 vehicles during the peak hour. A figure showing the forecast driveway volumes is attached to this letter.

Operational Analysis

Levels of service for the project driveway were calculated using the Highway Capacity Manual methodology for unsignalized intersections. The levels of service were calculated and queue lengths estimated using both the Synchro and HCS+ software programs. The LOS worksheets are attached. The analysis completed using the Synchro software package resulted in LOS B operations for the eastbound left-turn movements with a forecast average vehicle delay of 13.9 seconds and a queue length of 1 vehicle. The analysis completed using the HCS+ software package resulted in LOS B operations for the left-turn movements with a forecast average vehicle delay of 13.4 seconds and a queue length of 1 vehicle. The left-turn storage proposed would therefore be sufficient for the forecasted volumes and queue lengths.

Qualitative Analysis

A qualitative analysis was also completed assuming the peak hour volumes and a uniform arrival pattern during the peak hour. Assuming uniform arrivals, the arrival rate would be 1.3 vehicles per minute (73 vehciles/60 minutes). Assuming a worst-case probability factor of 3 (or three standard deviations on a probability curve), there would be a maximum queue of 4 vehicles, or 88 feet. The provided storage length of 110 feet would therefore be adequate based on this analysis.
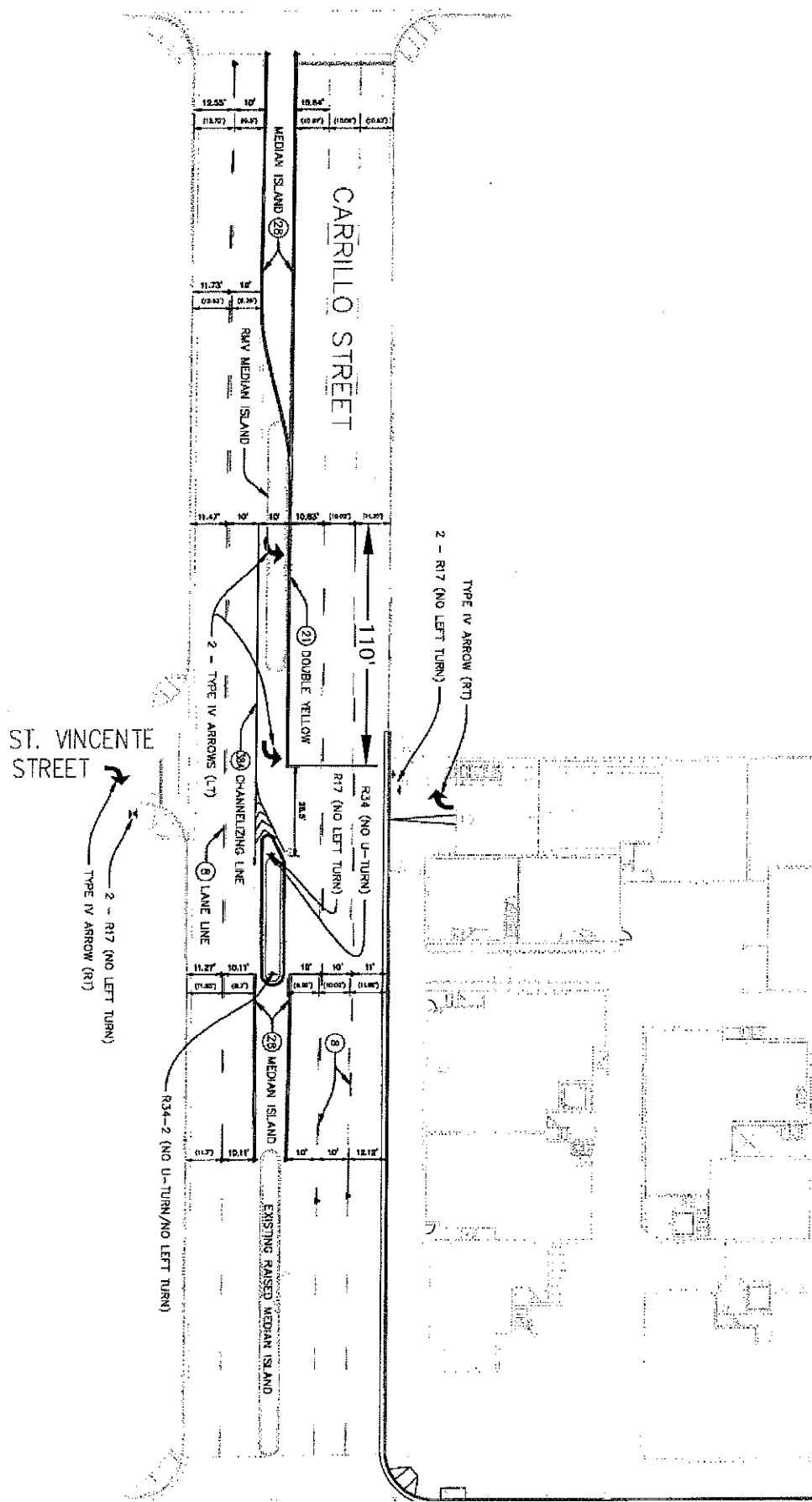
This concludes ATE's queuing analysis for the Radio Square Mixed-Use Project.

Scott A. Schell, AICP

SAS:JL

Attachments

CARRILLO STREET SITE ACCESS

FIGURE 1

JL #05166.01

ASSOCIATED TRANSPORTATION ENGINEERS

De La Vina Street
ONE-WAY →

PROJECT SITE
★

Figueroa Street

42
1333
19
79
78
1163

St. Vincent Avenue

Carrillo Street

Canon Perdido Street

Bath Street
← ONE-WAY

LEGEND

XX ⌐ - P.M. Peak Hour Volume

P.M. PEAK HOUR DRIVEWAY VOLUMES - WITH LEFT TURN ACCESS ALLOWED AT CARRILLO STREET

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Radio Square Mixed-Use Project
Traffic and Parking Study

Associated Transportation Engineers
September 15, 2006

TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	*Justin Link*
Agency/Co.	*ATE*
Date Performed	*10/27/2006*
Analysis Time Period	*P.M. Peak Hour*

Site Information

Intersection	*Project Driveway/Carrillo*
Jurisdiction	*Santa Barbara*
Analysis Year	*Existing+Project*

Project Description *05166.01 - Radio Square*

East/West Street: *Carrillo Street*	North/South Street: *Project Driveway*
Intersection Orientation: *East-West*	Study Period (hrs): *1.00*

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume (veh/h)	78	1163			1333	42
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR (veh/h)	78	1163	0	0	1333	42
Percent Heavy Vehicles	0	--	--	0	--	--
Median Type	Raised curb					
RT Channelized			0			0
Lanes	1	2	0	0	2	0
Configuration	L	T			T	TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume (veh/h)			19			79
Peak-Hour Factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Hourly Flow Rate, HFR (veh/h)	0	0	19	0	0	79
Percent Heavy Vehicles	0	0	0	0	0	0
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	1	0	0	1
Configuration			R			R

Delay, Queue Length, and Level of Service

Approach	Eastbound	Westbound	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L				R			R
v (veh/h)	78				19			79
C (m) (veh/h)	505				461			393
v/c	0.15				0.04			0.20
95% queue length	0.55				0.13			0.75
Control Delay (s/veh)	13.4				13.1			16.5
LOS	B				B			C
Approach Delay (s/veh)	--	--	13.1			16.5		
Approach LOS	--	--	B			C		

HCS+™ Version 5.2   Generated: 10/27/2006 3:47 PM

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↱	↟↟			↟↟↱				↱			↱
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	78	1163	0	0	1333	42	0	0	19	0	0	79
Peak Hour Factor	1.00	1.00	0.92	0.92	1.00	1.00	0.92	0.92	0.92	1.00	0.92	1.00
Hourly flow rate (vph)	78	1163	0	0	1333	42	0	0	21	0	0	79
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1375				1163			1842	2694	582	2112	2673	465
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1375				1163			1842	2694	582	2112	2673	465
tC, single (s)	4.2				4.1			7.5	6.5	6.9	7.6	6.5	7.0
tC, 2 stage (s)												
tF (s)	2.2				2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	84				100			100	100	95	100	100	85
cM capacity (veh/h)	485				596			35	18	457	24	18	538

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	SB 1
Volume Total	78	582	582	533	533	309	21	79
Volume Left	78	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	42	21	79
cSH	485	1700	1700	1700	1700	1700	457	538
Volume to Capacity	0.16	0.34	0.34	0.31	0.31	0.18	0.05	0.15
Queue Length 95th (ft)	14	0	0	0	0	0	4	13
Control Delay (s)	13.9	0.0	0.0	0.0	0.0	0.0	13.3	12.8
Lane LOS	B						B	B
Approach Delay (s)	0.9			0.0			13.3	12.8
Approach LOS							B	B

Intersection Summary

Average Delay	0.9	
Intersection Capacity Utilization	45.7%	ICU Level of Service A
Analysis Period (min)	15	